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NOTES ON THE VEGETATION OF THE LOWER WABASH VALLEY.

BY ROBERT RIDGWAY.

1. THE FORESTS OF THE BOTTOM LANDS.

THAT portion of the valley of the Wabash River and its tributaries lying south of latitude about $38^{\circ} 25'$ contains a sylva peculiarly rich, and also remarkable for combining within one area many of the characteristic trees, as well as other plants, of the northern, southern and southwestern portions of the United States, besides supporting the vegetation common to the whole Atlantic region or "Eastern Province." In this section of the country many species of the botanical districts named, in receding from their several centres of abundance, overlap each other, or reach their latitudinal or longitudinal limits of natural distribution; thus with the beech, sugar maple, the various oaks and other trees of the north, grow the bald cypress, the tupelo gum and the water locust of the south, and the catalpa and pecan of the southwest; while other trees such as the buckeyes, honey locust, black locust, coffee-bean, etc., especially characteristic of the country west of the Alleghanies, reach here their maximum of abundance. At the same time other trees of more extended distribution, grow scarcely anywhere else to such majestic size as they do here in the rich alluvial bottoms, the deep soil of which nourishes black walnuts, tulip trees, sycamores, white ashes and sweet gums of astonishing dimensions.

The mixed woods of the lower Wabash Valley consist of upwards of ninety species of trees, including all of those which reach a maximum height of over twenty feet; these are distributed through about twenty-five orders and fifty genera. In the heavy forests of the rich bottom lands more than sixty species usually grow together, though in various localities different species are the predominating ones.

The trees which usually attain the largest size are the following species, named nearly in the order of their maximum size:—sycamore (*Platanus occidentalis*), tulip-poplar (*Liriodendron tulipifera*), pecan (*Carya olivæformis*), over-cup or bur-oak (*Quercus*

macrocarpa), "Spanish oak" (*Q. coccinea* var?), white ash (*Fraxinus Americana*), bald cypress (*Taxodium distichum*), sweet gum (*Liquidambar styraciflua*), black walnut (*Juglans nigra*), white elm (*Ulmus Americana*), honey locust (*Gleditschia triacanthos*), cottonwood (*Populus monilifera*), beech (*Fagus ferruginea*), shell-bark hickory (*Carya alba*?), and white oak (*Quercus alba*). All of these often exceed one hundred and fifty feet in height, while the first three are known to go beyond one hundred and seventy-five feet, and no doubt sometimes nearly approach, if they do not actually reach, the altitude of two hundred feet. The principal trees of the second magnitude (*i. e.* which do not often grow more than one hundred feet high, and are more usually seventy feet and upwards), are hickories (*Carya sulcata*, *C. amara*, *C. tomentosa* and *C. porcina*), red oak (*Quercus rubra*), water oak or pin oak (*Q. palustris*), swamp white oak (*Q. bicolor*), swamp chestnut oak (*Q. prinus*), linden or bass-wood (*Tilia Americana*), sweet buckeye (*Æsculus flava*), sugar maple (*Acer saccharinum*), red maple (*A. rubrum*), silver maple (*A. dasycarpum*), black locust (*Robinia pseudacacia*), coffee-bean (*Gymnocladus Canadensis*), water locust (*Gleditschia monosperma*), black cherry (*Prunus serotina*), sour and tupelo gum (*Nyssa multiflora* and *N. uniflora*), blue ash (*Fraxinus quadrangulata*), black ash (*Fraxinus sambucifolia*), hackberries (*Celtis occidentalis* and *C. Mississippiensis*), black and yellow birches (*Betula nigra* and *B. lenta*), etc. Some of these trees, as the oaks and hickories, occasionally attain a very large size, equalling those of the first magnitude; but as a general thing, they do not grow much, if any, beyond one hundred feet in height.

The more abundant or characteristic of the middle-sized trees, or those usually growing from forty to seventy feet in height, are the following:—box elder (*Negundo aceroides*), fœtid buckeye (*Æsculus glabra*), persimmon (*Diospyros Virginicus*), catalpa (*Catalpa bignonioides*), red ash (*Fraxinus pubescens*), sassafras (*Sassafras officinale*), red or slippery elm (*Ulmus fulva*), winged elm (*U. alata*), mulberry (*Morus rubra*), butternut, or white walnut (*Juglans cinerea*), post oak (*Quercus obtusiloba*—not frequent in the bottomlands), willow oak (*Q. phellos*—rare), and laurel oak (*Quercus imbricaria*). The underwoods, composed of small trees from twenty to forty feet in height, are chiefly of the following species: pawpaw (*Asimina triloba*), prickly ash (*Xanthoxylum America-*

num), hop tree (*Ptelea trifoliata*), stag-horn, smooth and poison sumacs (*Rhus typhina*, *R. glabra* and *R. venenata*), redbud (*Cercis Canadensis*), wild plums and choke cherries (*Prunus Americana*, *P. Pensylvanica* and *P. Virginiana*), hawthorns, or "red haws" (*Cratægus coccinea*, *C. tomentosa*, *C. crus-galli*, and *C. flava*), crab apple (*Pyrus coronaria*), June berry (*Amelanchier Canadensis*), witch hazel (*Hamamelis Virginica*), dogwoods (*Cornus florida* and *C. alternifolia*), Viburnum (*Viburnum lentago*), black haw (*V. prunifolium*), green ash (*Fraxinus viridis*), iron-wood, or hop horn-beam (*Ostrya Virginica*), hornbeam, or water beech (*Carpinus Americanus*), etc.

The shrubby undergrowth or "underbush" is extremely varied and often so dense as to be nearly, if not quite, impenetrable. In the bottom lands it is composed in the main of spice bush (*Lindera benzoin* and *L. melissæfolia*?) and buttonbush (*Cephalanthus occidentalis*), which are the predominating species, the former generally distributed, and the latter mainly confined to the banks and ends of lagoons; but both are mingled with other shrubs far too numerous in species to mention, or nearly replaced by dense brakes of the small cane (*Arundinaria tecta*), and rank herbaceous plants, in almost endless variety.

In the heavy forests of the bottom-lands, which in many places have entirely escaped the ravages of the axe, the magnitude of the timber is such as is unknown to the scant woods of the eastern states, the stiff monotonous pineries of the north or the scrubby growth of other portions. The river flows for the greater part between dense walls of forest, which stand up to the very banks, and generally screened in front with a dense fringe of willows, with a belt of cottonwood and sycamores behind it. Viewing this forest wall from the opposite side of the river, there is seen a compact mass of verdure, the trunks of the trees being often hidden by the fronting belt of willows, which are often overrun by luxuriant masses of wild grape or other vines, often falling down to the very water's edge, so that even the bank itself is wholly concealed. If the forest is viewed from a high bluff, it presents the appearance of a compact, level sea of green, apparently almost endless, but bounded by the line of wooded bluffs three to seven miles back from the river; the tree-tops swaying with the passing breeze, and the general level broken by occasional giant trees which rear their massive heads so as to overlook the surrounding miles of

forest. The approximate height above the ground beneath of the average tree-top level is about one hundred and thirty feet—the lowest estimate after a series of careful measurements—while the occasional, and by no means infrequent, “monarchs” which often tower apparently for one-third their height above the tree-top line, attain an altitude of more than one hundred and eighty feet, or approach two hundred feet.

Of the ninety to a hundred species of trees of the lower Wabash Valley, about seventy exceed the height of forty feet; forty-six (perhaps fifty) exceed seventy feet in height, and about thirty are known to reach or exceed the height of one hundred feet. Of the latter class, as many as nine are known certainly to reach, or even exceed, the altitude of one hundred and fifty feet, while four of them (sycamore, tulip-poplar, pecan and sweet gum), attain, or go beyond, an elevation of one hundred and seventy-five feet! The maximum elevation of the tallest sycamore and tulip trees is probably not less than two hundred feet.

Going into these primitive woods, we find symmetrical, solid trunks of six feet and upwards in diameter, and fifty feet, or more, long to be not uncommon, in half a dozen or more species; while now and then we happen on one of those old sycamores, for which the rich alluvial bottoms of the western rivers are so famous, with a trunk thirty or even forty, possibly fifty or sixty, feet in circumference, while perhaps a hundred feet overhead stretch out its great white arms, each as large as the biggest trunks themselves of most eastern forests, and whose massive head is one of those which lifts itself so high above the surrounding tree-tops. The tall, shaft-like trunks of pecans, sweet gums or ashes, occasionally break on the sight through the dense undergrowth, or stand clear and upright in unobstructed view in the rich wet woods, and rise straight as an arrow for eighty or ninety, perhaps over a hundred, feet before the first branches are thrown out.

The following summaries of measurements, made in the summer and fall of 1871, in the vicinity of Mt. Carmel, Illinois, and mostly within a radius of ten miles, will serve to show pretty well the usual size of the large timber in that neighborhood. The measurements in the first column do not by any means represent the real maximum height of these species of trees in the Wabash Valley, since it was not often that trees of the largest size were found prostrate so that the total height and length of the trunk

could be measured satisfactorily. Very many trees seen and for these reasons not measured would materially swell the figures in the first two columns.

TABLE OF MAXIMUM SIZE ACCORDING TO TAPE LINE MEASUREMENTS.

	Total Height.	Length of trunk to first branch.	Circumference at 3 to 5 feet from ground.
Sycamore (<i>Platanus occidentalis</i>)*.....	168.....	68.....	33½.....
Tulip Poplar (<i>Liriodendron tulipifera</i>)†	182.....	91.....	23½.....
Pecan (<i>Carya olivæformis</i>).....	175.....	90.....	16.....
White Ash (<i>Fraxinus Americana</i>).....	144.....	90.....	17½.....
Black Walnut (<i>Juglans nigra</i>).....	120.....	60.....	22.....
"Spanish Oak" (<i>Quercus tinctoria</i> ?)....	150.....	75.....	20.....
Bur Oak (<i>Quercus macrocarpa</i>).....	162.....	70.....	21.....
White Oak (<i>Quercus alba</i>).....	142.....	60.....	17½.....
Cottonwood (<i>Populus monilifera</i>)‡....	165.....	75.....	19.....
Honey Locust (<i>Gleditschia triacanthos</i>)..	120.....	50.....	17.....
Sweet Gum (<i>Liquidambar styraciflua</i>)§..	144.....	70.....	17.....
Red Maple (<i>Acer rubrum</i>).....	108.....	70.....	11½.....
Bass (<i>Tilia Americana</i>).....	17.....
Sassafras (<i>Sassafras officinale</i>).....	95.....	75.....	7½.....
Mulberry (<i>Morus rubra</i>).....	60.....	20.....	10.....

TABLE OF AVERAGE DIMENSIONS.

SYCAMORE (*Platanus occidentalis*).

Height 168	feet.	} (Only one tree measured).
Trunk 18	"	
Circ. 28	"	
		Mean of 9 trees.

This is certainly the largest, both in height and bulk, of all the trees of the Mississippi Valley. Its form is very variable, the

*Only one tree measured for height, and this by no means a large one. I have been told on the very best authority of trunks forty feet in circumference.

†I know of one, not measured by myself, thirty-two feet in circumference, and have been told of a stump in Posey County, Indiana, which around the top is thirty-seven feet in circumference.

‡The tallest cottonwoods are no doubt one hundred and eighty feet or more in height.

§The tallest sweet gums are certainly 160-180 feet, perhaps much more in height, and with clear shafts of over a hundred feet in length.

trunk being sometimes a tall arrow-like shaft, equalling the finest *Coniferae* in straightness and gradual taper, the first branches being ninety to a hundred feet above the ground; but oftener, on the other hand, it is short and bulky, ten, fifteen or even rarely twenty feet in diameter, and only fifteen or twenty feet high, where three or four gigantic trunks separate and rise into a lofty massive head. The tallest of these sycamores rise apparently for one-third their height above the tree-top level of the forest, and are thus probably not less than two hundred feet in height.

TULIP TREE (*Liriodendron tulipifera*).

Height	142 $\frac{7}{9}$	feet.	Mean of 19 trees.
Trunk	69 $\frac{4}{5}$	"	" " 20 "
Circ.	19 $\frac{1}{3}$	"	" " 24 "

The second tree in size and very commonly of the above dimensions. The finest individual found prostrate was one cut for lumber near Timberville, Wabash County, Illinois; it measured one hundred and fifty-eight feet in total length, while the trunk was twenty-three feet in circumference three feet from the base, and eighteen feet in circumference at seventy-four feet further up, where the first branch grew; *the trunk perfectly sound and symmetrical throughout.*

PECAN (*Carya olivæformis*).

Height	170	feet.	Mean of 3 trees.
Trunk	85	"	" " 3 "
Circ.	15 $\frac{2}{3}$	"	" " 3 "

One of the most symmetrical and majestic of all our trees; the trunk clean, straight and long, and the head spreading and slightly drooping, usually elevated sixty to ninety feet from the ground.

WHITE ASH (*Fraxinus Americana*).

Height	140 $\frac{1}{2}$	feet.	Mean of 2 trees.
Trunk	79 $\frac{1}{2}$	"	" " 3 "
Circ.	14	"	" " 5 "

Also one of our finest trees; the trunk long and slightly tapering, though generally less straight than that of the pecan and "Spanish oak," and with the top less spreading.

BLACK WALNUT (*Juglans nigra*).

Height	125	feet.	Mean of 2 trees.			
Trunk	50	"	"	"	"	"
Circ.	18 $\frac{1}{8}$	"	"	"	3	"

Trunks of fifteen feet in circumference and forty or fifty feet long very common, so much so that in one locality in the "bottoms" five trees of this size stood within sight all at the same time in the thick woods.

"SPANISH OAK" (*Quercus coccinea* var?).

Height	120 $\frac{2}{3}$	feet.	Mean of 6 trees.			
Trunk	58 $\frac{4}{5}$	"	"	"	5	"
Circ.	17 $\frac{1}{2}$	"	"	"	6	"

The most stately and symmetrical of all our oaks; trunk straight and columnar and top massive and dense, reminding one in its appearance of the pecan. A more usual size is one hundred and fifty feet high, the trunk fifty feet long and fifteen feet in circumference four feet from the base.

BUR OAK (*Quercus macrocarpa*).

Height	119 $\frac{1}{5}$	feet.	Mean of 5 trees.			
Trunk	42 $\frac{2}{5}$	"	"	"	"	"
Circ.	19	"	"	"	6	"

The most massive, in proportion to its height, of all our oaks.

WHITE OAK (*Quercus alba*).

Height	115 $\frac{1}{6}$	feet.	Mean of 6 trees.			
Trunk	48 $\frac{1}{3}$	"	"	"	6	"
Circ.	14 $\frac{3}{4}$	"	"	"	8	"

COTTONWOOD (*Populus monilifera*).

Height	142 $\frac{1}{2}$	feet.	Mean of 4 trees.			
Trunk	61 $\frac{2}{3}$	"	"	"	3	"
Circ.	15 $\frac{1}{8}$	"	"	"	6	"

SWEET GUM (*Liquidambar styraciflua*).

Height	117 $\frac{3}{4}$	feet.	Mean of 7 trees.			
Trunk	62 $\frac{1}{2}$	"	"	"	4	"
Circ.	11 $\frac{7}{8}$	"	"	"	8	"

The tallest tree in proportion to its girth. The largest shafts are probably over one hundred feet, and the greatest circumference about seventeen or eighteen feet; while many trees no doubt exceed one hundred and sixty feet in height.

SASSAFRAS (*Sassafras officinale*).

Height	71 $\frac{2}{3}$	feet.	Mean of 3 trees.
Trunk	52 $\frac{1}{2}$	"	" " 2 "
Circ.	7 $\frac{2}{3}$	"	" " 3 "

Though usually considered one of the "underwoods," this tree is not unfrequently of these dimensions in very rich woods.

FOSSIL INSECTS FROM THE ROCKY MOUNTAINS.

BY SAMUEL H. SCUDDER.

SEVERAL years ago, Professor William Denton discovered in shales lying near the junction of the Green and White Rivers in Colorado (?), the first traces of tertiary insects on this continent. They were found in two distinct localities, sixty miles apart, the specimens from one place differing from those of the other, not only specifically, but also to a very great extent in the general character of the whole assemblage.* Reports of these discoveries attracted the attention of those who afterward explored parts of the Rocky Mountain region, and repeated inquiries were made concerning the exact location of the insectiferous beds. These explorations have resulted in the discovery of more fossil insects in the same general region by Mr. F. C. A. Richardson, who accompanied Major Powell's exploring party, and by Dr. Hayden in some of his numerous and fruitful researches. The latter brought home only three specimens, two flies and an ant, but the collections of the former are more numerous and afford material for the present notice.

Some doubt exists as to whether the insects discovered by Prof.

* See Proc. Bost. Soc. Nat. Hist., xi, 117-118. A detailed and illustrated Report upon these fossils, which Mr. Denton kindly lent for a long period of examination, will shortly be published.